

The Four Season Observer



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What's in this Issue?

- * **Four Season Spotter Classes** - page 1
- * **Rain Gauge Spotting** - pages 1-2
- * **The 1999 Severe Weather Season Recap: June 1 through August 27** - pages 2-3
- * **Higher Power for KIH-29** - page 3
- * **Climate Data Available On Line** - pages 3-4
- * **Great Lakes Temperature Warmer Than Average, NOAA Scientists Say Lake Levels at 30 Year Low** - page 4
- * **Commerce Secretary Daley Announces New Initiatives for Drought & Heat Forecasts** - pages 4- 5
- * **Mt. Baker Sets U.S. Snowfall Record & Possibly World Record** - pages 5-6
- * **Non-Precipitation Weather Products** - page 6
- * **Winter Weather Products** - page 6

Upcoming NWS Events

- * **First Day of Winter** - December 22, 1999 at 2:44 AM EDT

How to Reach Us?

The address for all newsletter correspondence is:

National Weather Service Forecast Office
ATTN: The Four Season Observer
9200 White Lake Rd
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Spotter Phone Line: (800) 808-0006 **Fax Line:** (248) 625-4834

Recorded Flint Weather Information: (248) 625-4542

Recorded Detroit Weather Information: (248) 620-2355

Four Season Spotter Classes *Darin J. Figurskey, WCM*

During early to mid November, the National Weather Service will conduct a number of **Four Season Spotter Classes**. The main focus of these spotter talks will be on winter weather spotting and safety, but they will also include other types of hazardous weather, such as winds, floods, and fog. The only hazardous weather that will not be discussed at these classes will be severe thunderstorms and tornadoes. These will be covered in our Spotter Classes coming up in Spring 2000.

Here is a preliminary list of sites where these **Four Season Spotter Classes** will be held:

Four Season Spotter Classes*				
County	City	Location	Date	Time
Shiawassee	Owosso	Owosso Fire Department	11/2	7 PM
Macomb	Sterling Heights	Freedom Hill	11/3	7 PM
Saginaw	Saginaw	Covenant Health Care Auditorium	11/8	7 PM
Monroe	Monroe	Emergency Operations Center (965 S. Raisinville)	11/9	7 PM
* As always, these locations, dates, and times are subject to change. Please contact the proper county Emergency Management Office if you plan to attend.				

Rain Gauge Spotting *Darin J. Figurskey, WCM*

Over the last several years, in Skywarn spotter training sessions, the National Weather Service office in White Lake has solicited volunteers to report rainfall whenever an inch or more has occurred within a 24-hour period. Well over 100 individuals are part of the Rain Gauge Spotter Network, with a goal of having one individual per township in southeast Michigan. Based on those who offered to be involved in the network from the spotter volunteer forms distributed at most of the 1999 Skywarn training sessions in southeast Michigan, three individuals will become new members of the network. These individuals will fill holes in townships where there are no rain gauge spotters in our database.

The information received from a rain gauge spotter helps the National Weather Service and its customers understand where the areas of heavy rainfall exist during a period of inclement weather. Many of the observations are distributed to National Weather Service customers via public information statements, listing the

community, the rainfall total, and the period of time during which the rain occurred (3 hours, 6 hours, 12 hours, 24 hours, etc.). If you have a rain gauge from the National Weather Service, remember that the criteria for reporting is **one inch of rain in 24 hours or less**. For those who are part of the rain gauge network, please report the inch of rain when you receive it, not only to pass along the information, but also to let us know you are “still out there”. For those who are not part of the network, feel free to note your interest on the spotter volunteer form in the 2000 Skywarn spotter training sessions. If there is no one involved in the network in the township where you live, you may become a new member.

The Michigan Net is also developing a rain gauge network throughout the state of Michigan with the help of licensed amateur radio operators. If you would be interested in assisting with this program, you can request a set of Standard Operating Procedures from the Michigan Net at the following address:

Michigan Net (QMN)
PO Box 970934
Ypsilanti MI 48197

The 1999 Severe Weather Season Recap: June 1st through August 27th

Raymond G. O'Keefe, Warning and Preparedness Meteorologist

After a slow start, the 1999 severe weather season “heated up” during July. Through August 27th, 154 severe weather events have been recorded in the NWS Detroit/Pontiac service area and 51% of those events occurred during an eight day period in late July! During July, Southeast Lower Michigan sat on the northern fringes of an upper level high pressure system anchored over the Southeast United States. This weather pattern pumped warm, and at times hot air into the region, along with excessive humidity. In addition, moderate to strong northwest winds at upper levels placed the area in the “ring of fire” (an active location for severe weather). With high temperatures, moisture at the surface, and strong winds aloft, it was not surprising that severe weather erupted. Here's a brief review of the severe weather events across Southeast Lower Michigan during June, July, and August.

June 9th: Severe thunderstorms developed in the afternoon and evening across Genesee, Livingston, and Lapeer counties. These storms blew up along an outflow boundary created by thunderstorms to the south earlier in the day. The NWS received reports of considerable tree damage, and minor damage to dwellings, between 5:40 PM and 7:35 PM.

June 10-11th: Temperatures in the 90s and dew points approaching 70 degrees provided ample instability for the development of widely scattered thunderstorms during the late afternoon and evening. Most of the storms developed on outflow and lake breeze boundaries with Midland County bearing the brunt of the severe weather. In addition to the severe weather, the slow movement of the storms prompted the issuance of a Flash Flood Warning for Midland County. Rainfall estimates of up to five inches were recorded near Midland. Severe reports from Midland County came in through much of the evening

between 7:35 PM and 10:31 PM. Meanwhile, localized severe damage was observed in Huron County at 4:30 PM and Oakland County at 6:45 PM.

June 11th: Hot, humid weather provided the ingredients for thunderstorm development across the region. Once again, severe weather struck Midland County. High winds reported at 6:05 PM were the primary culprit with this event as numerous tree limbs were reported down across the county. The slow moving thunderstorm produced two inches of rain in 20 minutes in Sanford; however, there was no report of flooding.

June 12th: This was another active severe weather day across Southeast Lower Michigan with 10 severe events. Initial storms developed on a Lake Erie breeze front across Monroe County. Subsequent development took place along lake breeze boundaries from Lake St. Clair and outflow boundaries from previous storms. Severe weather stretched from Macomb and St. Clair Counties south to Monroe and Lenawee Counties between 3:32 PM and 6:10 PM. Wind damage, especially in Monroe County, was the primary threat from these storms.

June 13th: This was the 5th consecutive day of severe thunderstorm activity. On this day, we received just one report of severe weather. Cloud cover across most of Southeast Lower Michigan limited the development of severe thunderstorms to only Monroe County where sunshine was prevalent through the afternoon. The activity took place between 3:15 PM and 4:20 PM. This was the last severe event for about two weeks.

June 28th: Strong thunderstorms developed ahead of a cold front approaching the region. One warning was issued for severe weather (Shiawassee County recorded trees down at 9:20 PM), then the event became a heavy precipitation problem. One spotter in Oakland County received over 3.5 inches of rain which prompted the issuance of a Flash Flood Warning.

July 17th: Hot, humid conditions resulted in isolated severe thunderstorms across the region. While frequent reports of funnel clouds were received from Lenawee and Tuscola Counties, there were no reports of tornadoes. Wind damage from collapsing thunderstorms was once again the main source of damage for this event. Reports of trees blown down came from Lapeer and St. Clair Counties, with a barn down reported in Tuscola County. This activity occurred between 12:25 PM and 3:05 PM.

July 21st: During the evening, a low-topped supercell developed over Monroe County. Spotters reported 65 mph straight line winds with two to three foot trees down near Maybee at 8:25 PM.

July 23rd: During the early morning hours, a cluster of thunderstorms developed over northern Wisconsin and trekked southeast into Lower Michigan by early afternoon. Meanwhile, thunderstorms developed during the afternoon along an old frontal boundary across Southeast Lower Michigan. With temperatures in the 90s and dew points approaching 80 (!) degrees, extreme instability developed across the region. As the thunderstorm cluster from Wisconsin intersected the line of thunderstorms already over Southeast Lower Michigan, severe

thunderstorm development took place rapidly. Severe reports stretched from Midland County in the north to Lenawee County in the south. Severe weather occurred between 1:10 PM and 6:00 PM. Wind gusts to 70 mph and rainfall reaching two inches across Oakland County were noted with this event. While not quite the largest event of the year in terms of county warnings (there were 15 counties warned in this event vs. 20 severe warnings on May 17th), it certainly was the largest in terms of impact to the most people, and the week had just begun.

July 24th: A weak surface trough crossing the region initiated severe thunderstorms in the unstable, moist air. The severe activity occurred across the northern portion of the Detroit/Pontiac forecast area. There were reports of thunderstorm wind gusts to 60 mph which brought down large tree limbs. There were also a few reports of golf ball size hail (1.75 inches in diameter) in Bay County; however, most of the hail reports were dime and nickel size. In addition, ten boats were reported capsized on Saginaw Bay, with all occupants safely making it back to shore. Once again this was a prolonged event with severe weather first reported in Bay County at 2:55 PM and the last reports in Oakland and Macomb Counties at 5:25 PM.

July 25th: Late in the evening, an old outflow boundary provided the focusing mechanism for convection. Despite the hour (11 PM), the atmosphere was sufficiently unstable to produce a supercell over Lenawee County. The strong rotation in the supercell noted on the NWS Doppler radar prompted the issuance of a Tornado Warning for Lenawee County. Although reports of funnel clouds were received, there was no confirmation of a tornado. The storm did knock down several trees in Washtenaw County. The severe weather straddled midnight with the first reports received at 11:56 PM and the last at 12:20 AM.

July 28th: Persistent July heat and humidity provided an ideal environment for the development of severe weather. Thunderstorms developed along a weak cold front moving into Southeast Lower Michigan during the late afternoon. Strong winds aloft helped those thunderstorms to become severe. A supercell developed over Sanilac County and tracked southeast into St. Clair County. This supercell prompted the issuance of three Tornado Warnings (two in Sanilac County and one in St. Clair County). A subsequent survey by NWS personnel confirmed a tornado in St. Clair County, but none was confirmed in Sanilac County. The St. Clair County tornado, the 5th of the 1999 severe weather season, was rated a F-1 on the Fujita scale, and struck at 8:05 PM. This tornado was the 17th to strike St. Clair County since reliable records began to be kept in 1950, and the first tornado in St. Clair County since June 22, 1996. Further evidence of the severity of this supercell was the report of baseball size hail (2.75 inches in diameter) received from Elmer, Sanilac County. Severe weather bracketed the tornado with the first reports arriving at 7:00 PM and the last at 9:24 PM.

July 31st: After a prolonged stretch of hot, humid weather (July 1999 would go down in the books as the 6th warmest July, and the 8th warmest month on record in Detroit), a vigorous cold front approaching the region offered relief. However, relief would require a price. One more day of heat and humidity provided the instability and the cold front was the focusing mechanism during the early to mid

afternoon. Severe thunderstorms were reported from St. Clair and Genesee Counties south to Lenawee County between 1:34 PM and 3:58 PM. Damage from these storms was the result of high winds producing downed tree limbs and snapped utility poles. One observer reported a wind gust to 83 mph near Avoca in St. Clair County.

August 13th: A vigorous cold front along with modest instability provided the ingredients for an isolated bout of severe weather between 5:00 PM and 5:30 PM in Oakland (just down the road from the NWS office) and Macomb Counties. Wind speeds estimated near 70 mph blew down a few trees in Oakland County and snapped utility poles along Mound Round in Sterling Heights.

August 26th: During the Weather Garden segment on WNEM-TV Channel 5's Take 5 Newscast, Chief Meteorologist Mark Torregrossa and photojournalist Gary Linkowski filmed a weak F-0 tornado on the Fujita Scale as it developed about 2 miles east southeast of Reese in Tuscola County. According to eyewitness reports, the tornado touched down briefly around 5:20 PM. Other than picking up some soybean plants, there were no other reports of damage with the tornado. The tornado developed as a result of very cold air aloft and the interaction with a lake breeze boundary. This was the 6th tornado of the 1999 severe weather season.

A special thanks goes out to the media, law enforcement, and our spotters who have provided the National Weather Service with valuable reports so far this severe weather season. Thanks, too, to the individuals who have given the National Weather Service some great information when we've called. The information received from spotters and call volunteers adds lots of credibility to the warnings and statements that we issue. Your reports also help NWS meteorologists better understand the nature of the atmospheric phenomena that is occurring.

Higher Power for KIH-29 ***Darin Figurskey, WCM***

On September 1st, the power of the NOAA Weather Radio transmitter for station KIH-29 was increased to 1000 Watts. KIH-29's transmitter is located in Clio, and that station serves the Saginaw Valley, Flint area, and the Thumb through broadcasts originating from the National Weather Service office in White Lake. Prior to September 1st, the power of the transmitter was only 600 Watts, but through coordination with officials from Canada, the National Weather Service was able to increase the power to the maximum allowable for NOAA Weather Radio transmitters. For those who are able to receive the NOAA Weather Radio broadcasts from KIH-29, we hope this improvement will help you to get a clearer reception of National Weather Service forecasts, observations, and warnings.

Climate Data Available On Line ***Patricia Viets, NOAA Public Affairs***

Climate data dating back to the late 1800's are now available on line, the Commerce Department's National Oceanic and Atmospheric Administration announced on August 16, 1999. The data were

previously available only via telephone or written request.

The new Climatic Data Online system provides full period-of-record digital data for: U.S. daily surface data; U.S. monthly surface data; U.S. hourly precipitation data; U.S. 15-minute precipitation data; and global monthly surface data. Other data will be added to the system this year and next, including hourly surface data. The data are provided by NOAA's National Climatic Data Center in Asheville, N.C.

The user can select data by region, country, state, climate division, county, and station, and by time period, such as year, month, or day. Data are currently provided at no charge to educational institutions, with charges by credit card for others. Charges are significantly reduced compared with off-line orders. The Web address is:

<http://www5.ncdc.noaa.gov:7777/plclimprod/plsql/poemain.poe>
Great Lakes Temperature Warmer Than Average,
NOAA Scientists Say Lake Levels at 30 Year Low
Jana Goldman, NOAA Public Affairs

The relatively warm winters of the past several years set the stage for the high Lake Michigan water surface temperatures recorded this past July, lake experts at the National Oceanic and Atmospheric Administration said on August 12, 1999.

"Based on the last six years, both 1998 and 1999 are warmer than average," said Michael McCormick, an oceanographer at NOAA's Great Lakes Environmental Laboratory.

As a result of the warmer temperatures, and because of the lack of rain and mild winters, the Great Lakes are at a 30-year low and three to nine inches below their long-term averages. While providing wider beaches for swimmers and those living along the shore, lower water levels are causing problems for some boat owners who need to seek deeper water for docking and recreational boating.

Long-term temperature records in the Great Lakes exist at various municipal water intake points. However, only recently has it been possible to obtain lakewide measurements of water temperatures. NOAA's Great Lakes Environmental Laboratory (GLERL) in Ann Arbor, MI, has developed a Great Lakes Surface Environmental Analysis (GLSEA) that uses satellite-derived water temperature data.

Based on 50 years of modeled data which reconstructs temperature data based on meteorological records, July 1999 is the third warmest year of the last 50 years for Lake Michigan, following 1998 and 1995. The preceding winter temperatures of those two years were also warmer than normal. Inferences on climate changes in the Great Lakes water temperature require much longer data records, the scientists say.

Prolonged heat waves and calm conditions can heat up the very near surfaces and near shore waters. For example, conditions during the week of August 6-12, 1999 caused the average near surface temperatures in Lake Michigan to exceed those measured at any time during the last six years. Further modeling analyses suggest that all the Great Lakes have shown higher-than-normal monthly water surface temperatures for the past 18 months.

Because of the large volumes of water and extreme depths, the Great Lakes' lake-wide temperatures respond slowly to day-to-day shifts in air temperature and are more representative of seasonal or longer changes in weather. The higher than average water temperatures are likely to increase the late summer and fall evaporation, which will further reduce seasonal water levels, said Frank Quinn, senior hydrologist at GLERL.

Lower levels also mean that the lake freighters that carry iron ore, coal, and limestone between Great Lakes ports such as Duluth, South Chicago, and Toledo cannot travel fully loaded because of the low water levels in the harbors and connecting channels. According to the Lake Carriers Association, an organization that represents U.S. flag vessel operators on the Great Lakes, "Vessels working the Great Lakes forfeit anywhere from 70 to 270 tons of cargo for each one inch reduction in loaded draft." The association reports an 8.6 percent decrease in shipments of iron ore, coal, and stone in April - the most recent figure available - compared with the same period last year. The outlook is for lower levels during the coming fall and winter because of the normal seasonal decline in water levels, Quinn said.

NOAA's mission is to describe and predict changes in the earth's environment and to conserve and manage wisely the nation's coastal and marine resources.

For more information on the Great Lakes, visit:

<http://www.glerl.noaa.gov>
<http://coastwatch.glerl.noaa.gov>

For Great Lakes shipping information, visit:

<http://www.lcaships.com>

All NOAA press releases and links to other NOAA material can be found on the Internet at:

<http://www.publicaffairs.noaa.gov/releases99/>

Journalists who wish to be added to NOAA's press release distribution list, or who wish to switch from fax to e-mail delivery can send an e-mail to: releases@www.rdc.noaa.gov or fax to (202) 482-3142.

Commerce Secretary Daley Announces New Initiatives for Drought & Heat Forecasts ***Donald R. Wernly, Chief Customer Service of Meteorology***

On August 11, 1999, Commerce Secretary William Daley unveiled two new initiatives aimed at issuing drought and heat advisories. Daley made the announcement at a White House briefing.

Daley also said that by next summer forecasts will be available two weeks in advance on the probability of heat waves. Daley said the

Commerce Department is following through on the President's call for federal action by providing new tools to help the country manage droughts and heat waves.

Web-Based Heat Advisory:

Starting immediately, Commerce Secretary William Daley has instructed the National Oceanic and Atmospheric Administration (NOAA) to make available to managers, planners and the public a weekly assessment of potential heat threats. These assessments are now posted and updated weekly at:

<http://www.cpc.ncep.noaa.gov/products/predictions/threats>

Previously, these assessments had been available only on a local basis. This action will now make it possible for any official or citizen anywhere to access this vital information. It also integrates the heat assessments with assessments of other weather-related threats. With this action, there is a one-stop shop for all of NOAA's weather threat data.

Called the Threats Assessment, it consists of maps that show where extreme conditions such as temperature, precipitation, wind, and drought are forecast over the coming three to ten days. It is updated weekly or more frequently as events require. The Threats Assessment targets emergency managers, local officials, and forecasters. It provides information that communities and individuals can use to take precautionary steps to mitigate the impacts of extreme events. This product has been in development for nearly two years. NOAA worked with a wide range of stakeholders to create a tool that is useful at the state and local levels.

Drought Mapping & Forecast Service:

Also starting immediately, the Commerce Department, working in conjunction with the Department of Agriculture and the National Drought Mitigation Center, has launched a drought monitoring and forecast service. This service, which had been available only in experimental form, summarizes the extent and intensity of drought nationwide, and forecasts whether droughts will strengthen or weaken. The Drought Monitor is on the Internet at:

<http://enso.unl.edu/monitor/monitor.html>

The three-way partnership is responding to the need for accurate, centralized drought information by developing a map that summarizes information from numerous drought indices and indicators on a single, easy-to-read color map.

The map displays general areas where drought is occurring as well as dry areas where drought threatens. To create the map, the partnership blends information from numerous sources, including the departments of Commerce, Agriculture and Interior.

The map uses a new classification system to show drought intensity and type, similar to the schemes currently in use for hurricanes and tornadoes. The map combines key indices of rainfall

and drought to produce the final drought intensity rating. Since drought often affects various activities differently, the map indicates if drought is affecting agriculture, fire danger, or water supplies. State-of-the-art forecast tools are being used to indicate whether drought will strengthen or weaken significantly over the next two weeks.

Two Week Warnings for Extreme Heat Events:

Finally, for next summer, NOAA will extend extreme heat forecasts for up to two weeks in advance. The predictions will be in the form of probabilities of the number of consecutive days heat indices will exceed critical values. The forecasts will be included in the newly operational weekly Threats Assessment. For the first time, these forecasts will provide officials and leaders from organizations like the American Red Cross with a "heads-up" for potentially life threatening conditions well in advance. Local NOAA weather service offices will then work with health officials and communities to highlight the impacts to the area. This information should help the public to take informed, life-saving actions. Since this product is not yet available, there is no web site set up for it yet.

Mt. Baker Sets U.S. Snowfall Record & Possibly World Record Pat Viets, NOAA Public Affairs

On August 2, 1999, it became official that Mt. Baker, Washington, had set a new record for the most snowfall ever measured in the United States in a single season. The Mt. Baker Ski Area in northwestern Washington State reported 1,140 inches of snowfall for the 1998-99 snowfall season. The figure was scrutinized by the National Climate Extremes Committee, which is responsible for evaluating potential national record-setting extreme events. The committee, composed of experts from NOAA, the American Association of State Climatologists, and a regional expert from the Western Regional Climate Center, made a unanimous recommendation to the director of NOAA's National Climatic Data Center to accept the figure.

"In accepting the validity of the 1,140 inches of snowfall at Mt. Baker, the National Climatic Data Center recognizes that a new record has been set," said Tom Karl, director of the center. "The previous U.S. seasonal snowfall record was 1,122 inches, set during the 1971-1972 snowfall season at Mt. Rainer/Paradise, a station located at 5,500 feet on the slopes of Mt. Rainer, about 150 miles south of Mt. Baker."

Snowfall can be extremely difficult to measure accurately because it settles, melts, and during times of wind, drifts from place to place. The committee reports that the measurements met snowfall observation standards and practices prescribed by the National Weather Service, and were thus considered to be an accurate depiction of snowfall amounts that fell.

“The measurement frequency was once a day; a flat surface was used to measure daily snowfall amounts; and a snow stake for snow depth measurement was also in place,” said Raymond Downs, an observations standards expert on the committee. “Both snowfall and snow depth were measured in acceptable locations. The bottom line is the observations were taken in a manner that meets official observation standards.”

Robert Leffler, team leader for the evaluation, said, “Committee members voted to recognize the amount as a new U.S. record because of several factors. These include acceptable snowfall measurement methods, detailed record-keeping, and other corroborative evidence such as independent snow data from other sources, eyewitness accounts, and unusual damage to trees and structures resulting from the crushing weight of the deep snow pack and avalanches.”

The Mt. Baker Ski Area is located at an elevation of 4,200 feet, nine miles northeast of the summit of the Mt. Baker volcano. The snowfall season is for the period from July 1, 1998, through June 30, 1999. The committee was concerned only with national records for the United States. However, this total also stands as a world record for a verifiable amount.

The heavy snowfalls normally experienced in the Cascade Mountains of Washington State are the result of several factors. Winter is naturally the wettest season as the west-to-east planetary circulations expands southward and strengthens in speed, with storms striking the Pacific Northwest every few days. Air laden with moisture after its journey across the Pacific is forced to ascend the Cascade Range, dropping abundant precipitation. Freezing levels average about 4,000 feet over the winter months, so that near this altitude snowfall amounts increase very rapidly with just small increases in elevation.

This season, a moderately strong La Niña pattern is credited with accentuating this storminess, with a much higher frequency of wet and cold weather systems affecting especially the area from the Cascade Range westward. Freezing levels remained abnormally and consistently low throughout the winter.

Non-Precipitation Weather Products

Jeff Boyne, Forecaster

These weather products are issued by the National Weather Service when a non-precipitation weather event creates a hazard, or it is life threatening. The following table gives the criteria for each product:

Non-Precipitation Weather Products	
Product	Criteria
Dense Fog Advisory	Widespread visibilities reduced 1/4 mile or less by fog.
Frost/Freeze Advisory	Freezing temperatures, or conditions conducive to the formation of frost, during the growing season.

High Wind Advisory	Sustained non-convective (not related to thunderstorms) winds greater than or equal to 30 mph lasting for one hour or longer, or winds greater than or equal to 45 mph for any duration.
Heat Advisory	A heat index of 105°F or higher for a period of 3 hours or more.
Excessive Heat Warning	A heat index of 115°F or higher for a period of 3 hours or more.
High Wind Watch	Potential for sustained non-convective (not related to thunderstorms) winds greater than or equal to 40 mph and/or gusts greater than or equal to 58 mph.
High Wind Warning	Sustained non-convective (not related to thunderstorms) winds greater than or equal to 40 mph and/or gusts greater than or equal to 58 mph.

Winter Weather Products

Jeff Boyne, Forecaster

With the leaves already beginning to turn and fall off the trees in Southeast Lower Michigan, it is that time once again to review the criteria for the various winter weather products that we may issue during this upcoming winter. The following table gives the criteria for each product:

Winter Weather Products	
Product	Criteria
Snow Advisory	A low pressure system which produces snow (average of forecast range) greater than 3 inches, but less than warning criteria (6 inches in Lower Michigan and 8 inches in Upper Michigan) in 12 hours.
Snow & Blowing Snow Advisory	Situations that cause significant inconveniences, but do not meet warning criteria and if caution is not exercised could lead to life-threatening situations.
Freezing Rain Advisory	Situations that cause significant inconveniences, but do not meet warning criteria and if caution is not exercised could lead to life-threatening situations.
Lake Effect Snow Advisory	A pure lake effect snow event (this is one where all of the snow is a direct result of lake effect and not because of a low pressure system) that is forecasted to produce snow (average of forecast range) greater than 3 inches, but less than warning criteria (6 inches in Lower Michigan and 8 inches in Upper Michigan) in 12 hours.
Lake Effect Snow Warning	A pure lake effect snow event (this is one where all of the snow is a direct result of lake effect and not because of a low pressure system) that is forecasted to produce: <u>Lower Michigan:</u> snow greater than or equal to 6 inches in 12 hours, or greater than or equal to 8 inches in 24 hours <u>Upper Michigan:</u> snow greater than or equal to 8 inches in 12 hours or greater than or equal to 10 inches in 24 hours

Winter Weather Advisory	A low pressure system which produces a combination of winter weather (snow, freezing rain, sleet, etc) that present a hazard, but does not meet warning criteria. In this case, snowfall does not have to reach Snow Advisory criteria.
Wind Chill Advisory	A 10 mph or greater wind and wind chill forecasted of -30 to -50 degrees F.
Wind Chill Warning	A 10 mph or greater wind and wind chill forecasted of being -50 degrees F or colder.
Winter Storm Watch	The potential of: <u>Lower Michigan*</u> : snow greater than or equal to 6 inches in 12 hours; or greater than or equal to 8 inches in 24 hours <u>Upper Michigan*</u> : snow greater than or equal to 8 inches in 12 hours; or greater than or equal to 10 inches in 24 hours *Lesser amounts for mixed precipitation, blowing, etc.
Winter Storm Warning	A Winter Storm producing: <u>Lower Michigan*</u> : snow greater than or equal to 6 inches in 12 hours; or greater than or equal to 8 inches in 24 hours <u>Upper Michigan*</u> : snow greater than or equal to 8 inches in 12 hours; or greater than or equal to 10 inches in 24 hours *Lesser amounts for mixed precipitation, blowing, etc.
Blizzard Warning	Sustained wind or frequent gusts to 35 mph or more and considerable falling and/or blowing snow reducing visibility frequently to less than 1/4 mile (<u>Duration</u> : 3 hours or longer).
Ice Storm Warning	Freezing rain producing a significant, and possibly damaging accumulation of ice (normally an ice accumulation of 1/4 inch or greater).